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54 Stabilized sodium percarbonate composition.

57 A stabilized sodium percarbonate is obtained by incorporating therein (A) at least one compound selected from the group consisting of mono- and dicarboxylic acids having not less than four carbon atoms and salts thereof; and (B) at least one compound selected from the group consisting of sulfates, nitrates and silicates of alkali metals and alkaline earth metals.

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## STABILIZED SODIUM PERCARBONATE COMPOSITION

Background of the Invention

The present invention relates to a stabilized sodium percarbonate composition, particularly a stabilized sodium percarbonate composition suitable for use as a bleaching agent in detergents, etc.

Sodium percarbonate is generally used widely as a bleaching agent, a detergent, or a sterilizer. Sodium percarbonate as a bleaching agent is superior in solubility at low temperatures, exhibits a high bleaching effect, and is a stable compound in an ordinary preserved state. However, sodium percarbonate is disadvantageous in that it is unstable when preserved in high humidity conditions or when incorporated in a detergent. As a household detergent, a product containing a predetermined amount of sodium percarbonate as a bleaching agent is particularly preferred. When incorporated in a detergent, however, sodium percarbonate loses its stability upon contact with zeolite which is used as a builder or with water contained in a very small amount in the detergent, resulting in that the sodium percarbonate no longer exhibits the bleaching effect and there is fear of the detergent losing its effect. Various proposals have heretofore been made for solving these problems. For example in Japanese Patent Publication No. 56167/1988 there is disclosed a method wherein sodium percarbonate is coated with magnesium sulfonate or magnesium salt of sulfuric ester; in Japanese Patent Publication No. 57362/1988 there is disclosed a method wherein sodium percarbonate is coated with such magnesium salt plus sulfate or hydrochloride of an alkali or alkaline earth metal; in Japanese Patent Laid-Open No. 118606/1085 there is disclosed a method wherein sodium percarbonate is coated with boric acid or a partially neutralized borate and a water repellent; in Japanese Patent Laid-Open No. 194000/1984 a method wherein sodium percarbonate is coated with a borate and a magnesium compound; and in Japanese Patent Laid-Open No. 129500/1975 a method wherein sodium percarbonate is coated with a mixture of a surfactant and a water-insoluble compound which is compatible with the surfactant. All of these methods intend to prevent sodium percarbonate from coming into contact with detergent ingredients to stabilize it by coating it with specific chemical substances. According to these conventional methods, however, when the sodium percarbonate thus coated is preserved in a high humidity condition or when incorporated in a detergent, the stabilization effect is not attained to a satisfactory extent in practical use.

It is the object of the present invention to solve the above-mentioned problem. The present inventors found that the aforesaid problem which had not been solved by the prior art could be overcome by incorporating in sodium percarbonate a mono- or dicarboxylic acid having not less than four carbon atoms or a salt thereof and a sulfate, nitrate or silicate of an alkali metal or alkaline earth metal. In this way we reached the present invention.

35 Summary of the Invention

The present invention resides in a composition comprising sodium percarbonate and a stabilizer, the stabilizer consisting essentially of:

- (a) at least one compound selected from the group consisting of mono- and dicarboxylic acids each having not less than four carbon atoms, and salts thereof; and
- (b) at least one compound selected from the group consisting of sulfates, nitrates and silicates of alkali metals and alkaline earth metals.

This sodium percarbonate composition, as compared with the conventional sodium percarbonate, is remarkably improved in its stability during preservation in a high humidity condition or when incorporated in a detergent.

Detailed Description of the Invention

Examples of mono and dicarboxylic acids each having not less than four carbon atoms which may be used in the present invention include saturated or unsaturated aliphatic, alicyclic or aromatic mono- or dicarboxylic acids having 4 to 20 carbon atoms. More concrete examples are butyric acid, isobutyric acid, valeric acid, caproic acid, caprylic acid, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, isostearic acid, arachic acid, behenic acid, lignoceric acid, cyclohexanecarboxylic acid, crotonic acid, 2-methylacrylic acid, sorbic acid, 2,4-pentadienoic acid, zoomaric acid, linolenic acid, linoleic acid, ricinoleic

acid, gadoleic acid, erucic acid, selacholeic acid, benzoic acid, diphenylacetic acid, toluic acid, p-t-butylbenzoic acid, phenylacetic acid, benzoylbenzoic acid, ethylbenzoic acid, 2,3,5-trimethylbenzoic acid,  $\alpha$ -naphthoic acid,  $\beta$ -naphthoic acid, 2-methylnaphthoic acid, sebacic acid, undecanoic acid, dodecane-dicarboxylic acid, brassylic acid, tetradecane-dicarboxylic acid, thapsinic acid, itaconic acid, muconic acid,  
 5 naphthenic acid, beef tallow fatty acid, horse fat fatty acid, mutton tallow fatty acid, lard fatty acid, coconut oil fatty acid, palm oil fatty acid, palm kernel oil fatty acid, soybean oil fatty acid, linseed oil fatty acid, castor oil fatty acid, rice bran oil fatty acid, rape oil fatty acid, and hydrogenated such fatty acids.

Examples of salts of mono- and dicarboxylic acids each having not less than four carbon atoms which may be used in the present invention include sodium salts, potassium salts, magnesium salts and calcium  
 10 salts of the C<sub>4</sub> or more mono- or dicarboxylic acids exemplified above.

Examples of sulfates, nitrates and silicates of alkali metals and alkaline earth metals which may be used in the present invention include sodium sulfate, potassium sulfate, magnesium sulfate, sodium nitrate, potassium nitrate, magnesium nitrate, calcium nitrate, sodium silicate (Nos. 1, 2 and 3), sodium metasilicate, sodium orthosilicate, and potassium silicate.

15 In the stabilizer used in the present invention, even if at least one compound selected from the group (A) or at least one compound selected from the group (B) is incorporated each alone in sodium percarbonate, there will not be obtained a satisfactory effect of stabilization. Only when both compounds are used together there is obtained a satisfactory effect.

It is preferable that the stabilizer components (A) and (B) in the present invention be used each in an  
 20 amount of 0.5 to 20 wt%. If the amount thereof is smaller than 0.5 wt%, there will not be obtained a satisfactory effect, while if the amount thereof is larger than 20 wt%, the effective oxygen concentration will be decreased more than necessary although a satisfactory effect of stabilization will be obtained. More preferably, the stabilizer components (A) and (B) are used each in an amount of 2 to 10 wt%.

For preparing the composition of the present invention there may be adopted any method provided it  
 25 permits uniform dispersion or incorporation of the stabilizer components (A) and (B) in sodium percarbonate. For example, the composition of the present invention can be prepared by mixing the compounds (A) and (B) with wet crystals obtained in a crystallization step and then granulating the resulting mixture. Or it can be prepared by dissolving the stabilizer components in water or an organic solvent and spraying the  
 30 resulting solution to flowing crystals or granules of sodium percarbonate followed by drying. A solution containing both compounds (A) and (B) may be sprayed in a single step, or separate solutions prepared using the compounds (A) and (B) respectively may be sprayed in two separate steps. Or one of the compounds (A) and (B) may be added at the time of granulation, while the other is sprayed as a solution. There also may be used conventional additives for sodium percarbonate such as stabilizers other than the  
 35 one used in the present invention as well as granulation binders.

#### Examples

The present invention will be described below in more detail in terms of working Examples of the  
 40 invention and Comparative Examples. But it is to be understood that the invention is not limited thereto.

#### Examples 1 - 29

45 Sodium carbonate and hydrogen peroxide were reacted together in an aqueous solution and the resulting crystals were separated by centrifugal filtration. Then, the resulting crystals of sodium percarbonate in a wet condition were mixed with a predetermined amount of each of the stabilizer components (A) shown in Table 1 in accordance with the corresponding composition ratio set forth also in the same table. The resulting mixture was extrusion granulated by means of a granulator equipped with a 1.0 mm mesh  
 50 wire gauze, followed by drying. 200 g of the granules thus obtained were fed into a rotary vacuum dryer equipped with a spray, coated and a 10-25% aqueous solution of the corresponding stabilizer component (B) shown in Table 1 was sprayed onto the granules little by little while heating was made to 70° C under reduced pressure in accordance with the corresponding composition ratio set forth in the same table. After termination of the spraying, the composition thus obtained was dried for 20 minutes. In this way there were  
 55 prepared sodium percarbonate compositions in accordance with the composition ratios described in Table 1, which compositions were found to range in effective oxygen concentration from 12.5% to 13.5%. Then 2g of the compositions were intimately mixed with 2 g of a powdered detergent zeolite and the resulting mixtures were allowed to stand for 48 hours under the conditions of 50° C and a relative humidity of 80%.

then determined for residual effective oxygen concentrations, from which the respective stabilities were calculated. The results are as set out in Table 1. The determination of effective oxygen concentration was performed according to an iodometric titration method. For comparison purpose, the same test was conducted also with respect to the use of sodium percarbonate not containing any stabilizer and the use of each stabilizer component alone, and the results obtained are showing as Comparative Examples in Table 1.

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Table 1

Ex.	Composition Ratio (%)					
15	No.	Sodium Percarbonate	Stabilizer Component (A)	Stabilizer Component (B)	Stability (%)	
	1	90	caproic Acid 5	magnesium 5	69	
	2	90	" 5	" 5	71	
20	3	90	cyclohexane- carboxylic acid 5	" 5	70	
	4	90	lauric acid 5	magnesium 5	73	
25	5	90	myristic acid 5	sodium sulfate 5	73	
	6	90	palmitic acid 5	" 5	75	
	7	90	stearic acid 5	potassium sulfate 5	70	
30	8	90	behenic acid 5	sodium nitrate 5	69	
	9	90	linolenic acid 5	magnesium nitrate 5	72	
35	10	90	" 5	" 5	75	
	11	90	recinoleic acid 5	magnesium sulfate 5	76	
	12	90	p-toluic acid 5	" 5	78	
40	13	90	phenylacetic acid 5	" 5	79	
	14	92	beef tallow fatty acid 5	" 3	73	
	15	92	horse fat fatty acid 5	" 3	72	
45	16	94	mutton tallow fatty acid 5	sodium silicate (No.3) 1	70	
	17	93	lard fatty acid 5	potassium silicate 2	72	
50	18	90	coconut oil fatty acid 5	sodium sulfate 5	75	
	19	90	palm kernel oil fatty acid 5	" 5	75	
55	20	90	soybean oil fatty acid 5	" 5	77	

Table 1 2 of 2

No.	Sodium Percarbonate	Stabilizer Component (A)	Stabilizer Component (B)	Stability (%)
21	94	linseed oil fatty acid 5	sodium silicate (No.3) 1	73
22	94	rice bran oil fatty acid 5	" 1	75
23	94	hydrogenated beef tallow fatty acid 5	" 1	76
24	92	hydrogenated horse fat fatty acid 5	magnesium sulfate 3	77
25	92	naphthenic acid (#125) 5	" 3	72
26	92	sodium oleate 5	" 3	77
27	90	potassium oleate 5	sodium sulfate 5	73
28	90	magnesium oleate 5	" 5	78
29	90	calcium oleate 5	" 5	74
Comp. Ex.				
1	100	_____	_____	20
2	95	_____	magnesium sulfate 5	25
3	99	_____	sodium silicate (No.3) 1	33
4	95	beef tallow fatty acid 5	_____	40
5	95	sodium oleate 5	_____	39
6	99.4	beef tallow fatty acid 0.3	magnesium sulfate 0.3	45
7	99.4	p-toluic acid 0.3	sodium sulfate 0.3	43

## Examples 30 - 49

200 g of 16 to 80 mesh granules of dried sodium percarbonate obtained by extrusive granulation were fed into a rotary vacuum dryer equipped with a spray coater and a 10-25% aqueous solution of each of the stabilizer components (B) shown in Table 2 was sprayed to the granules little by little while heating was made to 70° C under reduced pressure until a predetermined amount thereof was incorporated in the granules. Then, a 10-30% solution in ethanol of each of the stabilizer components (A) shown in the same table was sprayed in the same manner as above until a predetermined amount thereof was incorporated in

the granules. After termination of the spraying, the composition thus obtained was dried for 10 minutes. In this way there were prepared sodium percarbonate compositions in accordance with the composition ratios described in Table 2, which compositions were found to range in effective oxygen concentration from 12.0% to 13.5%. Then, the compositions were determined for stability in the same way as in Examples 1-29. The results are as set forth in Table 2.

Table 2

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Ex. No.	Sodium Percarbonate	Stabilizer Component (A)	Stabilizer Component (B)	Stability (%)
30	92	crotonic acid 5	magnesium sulfate 3	72
31	92	2-methylacrylic acid 5	" 3	73
32	92	sorbic acid 5	" 3	70
33	90	d-naphthoic acid 5	sodium sulfate 5	77
34	90	sebacic acid 5	" 5	70
35	90	didecane-dicarboxylic acid 5	" 5	80
36	90	tetradecane-dicarboxylic acid 5	" 5	81
37	90	muconic acid 5	" 5	72
38	90	beef tallow fatty acid 5	magnesium sulfate 5	81
39	90	" 5	sodium sulfate 5	76
40	93	" 5	sodium silicate (No.2) 2	75
41	93	" 5	sodium sulfate 2	72
42	92	" 5	magnesium nitrate 3	70
43	91.5 mixture	beef tallow soda soap 80% coconut oil soda soap 20% 5	sodium silicate (No.3) 0.5 sodium sulfate 3	80

Table 2  
2 of 2

No.	Sodium Percarbonate	Stabilizer component (A)	Stabilizer Component (B)	Stability (%)
44	92.5	benzoic acid 1	sodium silicate (No.3) 0.5	83
		naphthenic acid (#125) 1		
45	94	beef tallow fatty acid 2	sodium sulfate 3	
46	90	benzoic acid 1	magnesium sulfate 5	69
47	85	" 5	" 5	79
48	98	" 10	" 5	85
49	99	" 0.5	sodium sulfate 1	67
			sodium silicate (No.3) 0.5	
49	99	beef tallow fatty acid 0.5	sodium silicate (No.3) 0.5	63

### Claims

- (1) A stable sodium percarbonate composition comprising sodium percarbonate and the following components (A) and (B) incorporated therein:
- (A) at least one compound selected from the group consisting of mono- and dicarboxylic acids having not less than four carbon atoms and salts thereof; and
- (B) at least one compound selected from the group consisting of sulfates, nitrates and silicates of alkali metals and alkaline earth metals.
- (2) A stable sodium percarbonate as set forth in Claim 1, wherein the content of the component (A) and that of the component (B) are each in the range of 0.5 to 20 % by weight.
- (3) A stable sodium percarbonate as set forth in Claim 1, wherein the component (A) is a saturated or unsaturated, aliphatic, alicyclic or aromatic mono- or dicarboxylic acid having 4 to 20 carbon atoms.
- (4) A stable sodium percarbonate as set forth in Claim 1, wherein the salts in the component (A) are sodium salt, potassium salt, magnesium salt and calcium salt.
- (5) A stable sodium percarbonate as set forth in Claim 1, wherein the component (B) is sodium sulfate, potassium sulfate, magnesium sulfate, sodium nitrate, potassium nitrate, magnesium nitrate, calcium nitrate, sodium silicate, sodium metasilicate, sodium orthosilicate, or potassium silicate.



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# EUROPEAN SEARCH REPORT

Application Number

EP 90 30 7346

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	CHEMICAL ABSTRACTS, vol. 84, no. 8, 23 February 1976 Columbus, Ohio, USA page 157; right-hand column; ref. no. 46769V & JP-A-7592896 (Kao Soap Co.) 24.07.1975 * abstract *	1, 3-5	C01B15/10 ✓
X	CHEMICAL ABSTRACTS, vol. 99, no. 8, 22 August 1983 Columbus, Ohio, USA page 112; left-hand column; ref. no. 55833Y & JP-A-5874508 (Mitsubishi Gas Chemical Co.) 06.05.1983 * abstract *	1-5	
X	US-A-3459665 (J. SCHIEFER ET AL.) * column 8, lines 26 - 35 * * claim 1 *	1, 3-5	
A	FR-A-2247533 (E.I. DU PONT DE NEMOURS & CO.)		TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	FR-A-2293241 (UNILEVER N.V.)		C01B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 AUGUST 1990	Examiner VAN BELLINGEN I.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			